WHAT IS CLAIMED IS:

1.   A method for estimating the number of bits output from a video coder given a known spatial data content, $G = \{g_1,...,g_N\}$, of a group of luminance and chrominance blocks, and a known coding mode, d, where d represents the index of said coding mode, the method comprising the steps of:

(a) extracting a significant part of said spatial data content, G, in relation to said coding mode, d, to yield a feature vector F, said feature vector representing statistics and signal components of the luminance and chrominance data of said luminance and chrominance blocks;

(b) mapping said feature vector to yield a class index, c, for said respective group of luminance and chrominance blocks;

(c) mapping said class index, c, in relation to a quantization parameter, q, where said quantization parameter controls the scale of quantizer bin size, to an estimate of the number of quantization bits for said group of luminance and chrominance blocks; and

(d) determining an estimated total number of coding bits for said group of luminance and chrominance blocks from the combination of said estimated number of quantization bits and an estimated number of overhead bits, wherein said overhead bits represent the additional bits expended to represent respective portions of the bitstream.

2.   The method of claim 1, wherein said class index mapping step is performed by a two-to-one mapping.

3.   The method of claim 1, wherein said extracting step comprises the following steps:

(a)   assigning a first predetermined feature representative of the coding mode to one component of said feature vector; and

(b)   computing a second feature representative of said spatial content data and assigning said second feature to one component of said feature vector.

4.   The method of claim 3, wherein said computing step determines said second feature according to the following equation:

$$\sigma = \left(\frac{1}{|G|} \sum_{j \in \{1,...,N\}} \sum_{(x,y) \in g_j} \left| I(x,y) - d\,\bar{I}_j \right|^L \right)^{\frac{1}{L}}$$

where $\bar{I}_j$ represents the mean of j'th block, $(j \in \{1,...N\})$, and is defined as

$\bar{I}_j = \frac{1}{|g_j|} \sum_{(x,y) \in g_j} I(x,y)$, with I representing the value of either luminance or

chrominance $(d = 1)$ or the motion compensated value thereof $(d = 0)$, $|\cdot|$ denoting the cardinality of its operand and $L \geq 1$.

     5.   The method of claim 1, wherein said class index mapping step operates with a uniform scalar quantizer.

     6.   The method of claim 1, wherein said estimator mapping step determines said estimated number of quantization bits according to the following equation:

$$\hat{B}(g_1,...,g_N,d,q) = U(c,q) = E\left[B(g_1,...,g_N,d,q) \middle| V(T(g_1,...,g_N,d)) = c \right]$$

     7.   The method of claim 6, wherein the expected value in the equation is further estimated from the actual number of quantization bits for previously encoded groups of blocks.

     8.   The method of claim 7, wherein said estimation of the expected value for R^{th} group of blocks is performed according to the following equation:

$$\hat{B}(g_1^R,...,g_N^R,d^R,q) = U(c^R,q) = U^R(c^R,q)$$

$$U^R(c,q) = \frac{1}{P_{c,q}^{R-1}} \sum_{\substack{r\,:\,r<R,\\ Q^r=q,\\ V(T(g_1^r,...,g_N^r,d^r))=c}} B(g_1^r,...,g_N^r,d^r,Q^r)$$

where $P_{c,q}^X$ is the number of macroblocks prior to and including X'th macroblock which are of class c and are coded with parameter q.

     9.   The method of claim 7, wherein, if the number of groups of blocks is large, said second estimator mapping step determines said estimated number of quantization bits according to the following equation:

$$U^R(c,q) = U^{kZ}(c,q) \text{ for } kZ < R \le (k+1)Z, \text{ with}$$

$$U^{kZ}(c,q) = \begin{cases} \dfrac{P_{c,q}^{(k-1)Z} \, U^{(k-1)Z}(c,q) + \displaystyle\sum_{\substack{r \,:\, (k-1)Z < r \le kZ, \\ V(T(g_1^r, \ldots, g_6^r, d^r)) = c \\ Q^r = q}} B(g_1^r, \ldots, g_6^r, d^r, Q^r)}{P_{c,q}^{kZ}} & \text{if } P_{c,q}^{kZ} > P_{c,q}^{(k-1)Z} \\[6mm] U^{(k-1)Z}(c,q) & \text{else} \end{cases}$$

10.   The method of claim 9, wherein the number of actual quantization bits for the most recently quoted groups of blocks are emphasized by scaling

$$P_{c,q}^{kZ} \ \& \ P_{c,q}^{(K-1)Z}$$

11.   The method of claim 10, wherein said emphasizing is determined according to the following equation:

$$P_{c,q}^{kZ} = P_{c,q}^{kZ} / 2 \quad if \quad P_{c,q}^{kZ} > P_{c,q}^{max},$$

$$P_{c,q}^{(k-1)Z} = P_{c,q}^{(k-1)Z} / 2 \quad if \quad P_{c,q}^{kZ} > P_{c,q}^{max}$$

where $P_{c,q}^{max}$ is a threshold.

12.   The method of claim 1, wherein said estimated number of overhead bits is determined according to the following equation:

$$\hat{B}_{OV}^R(q) = \begin{cases} 1 & if \ \dfrac{1}{384} \displaystyle\sum_{j \in \{1, \ldots, 6\}} \sum_{(x,y) \in g_j^R} |I^{FD}(x,y)|^L < h(q) \\[6mm] \overline{B}_{OV} & \text{else} \end{cases}$$

where $\overline{B}_{OV}$ is the average number of overhead bits of coded groups of blocks of a previously coded picture and $h(q)$ is a function of q.

13.   A method for assigning quantization parameters to the groups of blocks of a picture comprising the steps of:

    i.   setting the quantization parameters of all groups of blocks of the picture equal to the largest value allowed by the video coding standard;

    ii. scanning said groups of blocks according to a certain scanning order, where the last group of blocks in the scanning order is followed by the first

group of blocks;

iii.   determining whether to code the next group of blocks in the said scanning order with the quantization parameter for the group of blocks;

iv.   decrementing the quantization parameter of said group of blocks;

v.   repeating steps (b)-(d) until the sum of the estimates for the number of coding bits of all of said groups of blocks exceeds the targeted number of coding bits, B^{TR}, for the picture.

14.   The method of claim 13, wherein the first, Z_0, of a number Z of groups of blocks are quantized with a quantization parameter of q, and the remaining number, Z-Z_0, of groups of blocks are quantized with a quantization parameter of $q+1$.

15.   The method of claim 13, wherein a group of blocks is coded if the following inequality is satisfied:

$$\frac{1}{384}\sum_{j\in\{1,\ldots,6\}}\sum_{(x,y)\in g_j^R}|I^{FD}(x,y)|^L\geq h(q)$$

16.   The method of claim 13, wherein said repeating step is terminated according to the following equation:

$$\sum_{r\in\{kZ+1,\ldots,(k+1)Z\}}U^r(c^r,q^r)+\hat{B}_{OV}^r(q^r)>B^{TR}$$

17.   A signal coding apparatus, comprising:

(a)   partitioning means for dividing a field of data into a plurality of data groups (macroblocks);

(b)   transform means for encoding respective ones of said plurality of data groups, said data groups represented by respective transform coefficients;

(c)   a quantizing means for compressing said respective transform coefficients representing said plurality of data groups;

(d)   a compressing means for further compressing said quantized transform coefficients; and

(e)   a rate control means for   mapping each unique pair of a class of features of said groups of data, and a quantization parameter to a

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unique estimate for a number of coding bits.

18.   The apparatus of claim 17, wherein said features of said groups of data comprises data indicating pixel luminance intensity values and corresponding pixel chrominance intensity values.

19.   The apparatus of claim 17, wherein said transform means comprises a two-dimensional orthogonal transform.

20.   The apparatus of claim 17, wherein said compressing means comprises a run-length coder and a variable length coder.

21.   The apparatus of claim 19, wherein said orthogonal transform comprises a discrete cosine transform operating on one of the intensity values of the pixels of a group of data, and the error of the temporal prediction from one or more temporally local groups of data.

22.   The apparatus of claim 17, wherein said quantizing means comprises a uniform scalar quantizer.

23.   A method for estimating the number of bits output from a video coder given a known spatial data content, $G = \{g_1,...,g_N\}$, of a group of luminance and chrominance blocks, and a known coding mode, d, where d represents the index of said coding mode, the method comprising the steps of:
          (a) extracting a significant part of said spatial data content, G, in relation to said coding mode, d, to yield a feature vector F, said feature vector representing statistics and signal components of the luminance and chrominance data of said luminance and chrominance blocks;
          (b) mapping said feature vector to yield a class index, c, for said respective group of luminance and chrominance blocks; and
          (c) mapping said class index, c, in relation to a quantization parameter, q, where said quantization parameter controls the scale of quantizer bin size, to an estimate of the number of coding bits for said group of luminance and group of chrominance blocks, wherein said coding bits comprise the quantization and

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overhead bits and said overhead bits represent the additional bits expended to represent respective portions of bitstsream.

24.   A method for assigning quantization parameters to the groups of blocks of a picture comprising the steps of:

    (a) setting the quantization parameters of all groups of blocks of the picture equal to the smallest value allowed by the video coding standard;

    (b) scanning said groups of blocks according to a certain scanning order, where the last group of blocks in the scanning order is followed by the first group of blocks;

    (c) determining whether to code the next group of blocks in the said scanning order with the quantization parameter for the group of blocks;

    (d) incrementing the quantization parameter of said group of blocks;

    (e) repeating steps (b)-(d) until the sum of the estimates for the number of coding bits of all of said groups of blocks falls below the targeted number of coding bits, B^{TR}, for the picture.

25. The method of claim 24, wherein the first, Z_0, of a number Z of groups of blocks are quantized with a quantization parameter of q, and the remaining number, $Z-Z_0$, of groups of blocks are quantized with a quantization parameter of $q—1$.

26. The method of claim 24, wherein a group of blocks is coded if the following inequality is satisfied:

$$\frac{1}{384} \sum_{j \in \{1,\ldots,6\}} \sum_{(x,y) \in g_j^R} | I^{FD}(x,y) |^L \geq h(q)$$

27. The method of claim 24, wherein said repeating step is terminated according to the following equation:

$$\sum_{r \in \{kZ+1,\ldots,(k+1)Z\}} U^r(c^r,q^r) + \hat{B}_{OV}^r(q^r) < B^{TR}$$